

Climate Change Effects table



Sector	Subsector	Potential Effects to Resources, Operations, and People
ATMOSPHERE	Air Temperature	Air temperature increases ~1°F per decade; greatest change in the north and in winter. Average spring/fall temps shift from below freezing to above freezing, changing freeze/thaw balance.
	Precipitation	Average annual precipitation increases. Relative amounts of snow, ice or rain change. Many areas experience drying conditions despite increased precipitation.
	Storms	Lightning and lightning-ignited fires continue to increase.
	Air quality	More smoke from longer and more intense fire seasons.
	Contaminants	Increased contaminants and shifting contaminant distribution.
CRYOSPHERE	Snow/ice	Later onset of freeze-up and snowfall + earlier spring snowmelt and break-up. Arctic snow cover declines with higher air temperatures and earlier spring thaw. Lack of snow cover leads to deeper freezing of water in the ground or rivers. Cultural resources are exposed as snow and ice patches melt and recede.
	Ice roads	Reduced winter transportation affects opportunities for travel and subsistence.
	Permafrost	Mercury & other pollutants are released into aquatic environments as permafrost thaws.
HYDROSPHERE	Freshwater	Stream flows from melting glaciers increase and then decrease over time. Ponds shrink as ground ice thaws or thermokarst drainage occurs in permafrost areas. Drainage from thawing waste and sewage dumps contaminates rural water supplies.
BIOSPHERE - vegetation and fire	General	Ecological "tipping points" are likely to result in rapid change, when conditions exceed physical or physiological thresholds (e.g., thaw, drought, water temperature).
	Vegetation	Increased agricultural production in Alaska because of longer growing season. Potential large-scale shift of tundra to shrubs, to conifers, to deciduous forests or grass. Atypical outbreaks of pests and diseases affect native species and increase fire hazards. Invasive exotic plant species and native species from other areas expand their ranges. Vegetation expands into deglaciated coastal areas, less into higher elevation areas. Tree species and vegetation classes shift as species of lower latitudes and altitudes expand.
	Forests	Mature forests and "old growth" decline because of drought, insects, disease, and fire.
	Fire	Models show a warmer climate leads to larger, more frequent and intense fires. Wildland fire hazards increase, affecting communities and isolated property owners. Fire-related landcover and soil changes result in vegetation shifts, permafrost thaw, etc.

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BIOSPHERE - wildlife	Wildlife	<p>Changes to terrestrial and aquatic species occur as ranges shift, contract, or expand, affecting visitor experience and subsistence throughout the parks.</p> <p>Parks and refuges may not be able to protect current species within their boundaries.</p> <p>Some species will suffer severe losses. So far, the greatest losses across all parks have been rodents, bats, and carnivores.</p> <p>Predator-prey relationships may change in unexpected ways.</p> <p>Migratory routes and destinations will change (e.g., wetlands, open tundra, snow patches).</p>
	Birds	<p>Arctic and alpine birds' breeding habitats reduced as trees and shrubs encroach on tundra.</p> <p>Geese could lose almost half of their breeding habitat due to change from tundra to taiga and boreal forest.</p> <p>Predation on ground nesting birds could increase if prey (lemming) abundance declines.</p> <p>Population cycles of birds and their prey could be out of sync due to higher temperatures.</p>
	Caribou/ Reindeer	<p>Caribou and reindeer health are affected by changes in weather, forage, and insects and pests.</p> <p>Earlier green-up could improve caribou calf survival because of more available forage.</p> <p>Caribou may suffer heavy losses if rain events prevent successful feeding during cold weather.</p>
	Moose	<p>Shifts in forests could mean less habitat for caribou, but more habitat for moose.</p> <p>Climate change could hinder moose calf birth success and moose calf survival.</p>
	Small Mammals	<p>Fire may create new burrowing habitat and forage growth to help vole populations.</p> <p>Less snow cover reduces survival of subnivalian species, due to increased predation & cold stress.</p>
	Fisheries	<p>New stream habitats become available for fish and wildlife as glaciers decline.</p> <p>Some salmon waters may become unsuitable for migration, spawning and incubation.</p> <p>Fish diseases increase with rising stream temperatures.</p> <p>Fish habitats in permafrost areas are degraded by slumps and sediment input into rivers.</p>
	Invertebrates	<p>Exotic pests expand from warmer areas, and endemic pests expand as host species are stressed.</p>
	Subsistence	<p>Altered animal migration patterns make subsistence hunting more challenging.</p> <p>Managing new species and intensified management of native species may be needed.</p>
OTHER	Tourism	<p>Longer summer seasons increase tourism. Some visitor activities increase, others decline.</p> <p>Landscape-level changes affect visitor experiences and access, visitor use patterns shift.</p>
	Wilderness	<p>Large-scale physical and biological changes across broad landscapes affect abundance and condition of wilderness-associated resources (e.g., glaciers, wildlife, access routes).</p> <p>Changing biophysical landscape affect key wilderness values such as naturalness, wild-untamed areas without permanent opportunities for solitude, etc.</p>
	TEK	<p>Uses of traditional ecological knowledge become less predictive and less reliable.</p>
	Development	<p>More natural resource development in Alaska with increasing global demand.</p> <p>Fuel and energy prices increase substantially with carbon mitigation measures. Transporting fuels to remote locations becomes more challenging and costly.</p>